

REMARKS/ARGUMENT

The Examiner is thanked for the careful review of this Application. Claim 9 has been amended. Claims 1-14 are pending in the application. Claims 1-14 stand rejected.

Rejections under 35 USC §103

Claims 1-14 were rejected under 35 USC §103(a) as being unpatentable over Tomita et al. (US Patent No. 5,593,540) in view of Chang et al. (US Patent No. 4,854,263). The rejection is traversed, and Applicants request reconsideration.

Tomita et al. discloses a plasma etching system that employs a particular gas supply system to suppress the plasma polymerization within the small holes in the shower electrode. Tomita et al. does not disclose “a corresponding plurality of electrode openings having electrode opening diameters that are greater than gas feed hole diameters of the plurality of gas feed holes,” as defined in independent claims 1 and 5 of the claimed invention. Tomita et al. also does not disclose “each one of the plurality of electrode openings being larger than each one of the plurality of gas feed holes,” as defined in independent claim 9 of the claimed invention.

The Examiner states that it would have been obvious to one of ordinary skill in the art to modify the apparatus of Tomita et al. to comprise electrode openings having diameters that are greater than gas feed hole diameters of the plurality of gas feed openings of Chang et al. because this would enhance dissociation and reactivity of the gases.

Chang et al. describes a gas manifold that can act as an electrode used in a plasma-enhanced chemical vapor deposition system (PECVD). Essentially, Chang et al. teach chemical vapor deposition onto a substrate, and the stated objects are providing a gas manifold designed to increase the dissociation and reactivity of gases such as nitrogen, providing an improved parallel plate and gas inlet manifold configuration for forming low hydrogen content silicon nitride, silicon oxide and silicon oxynitride films at high deposition rates using nitrogen with reduced ammonia or without ammonia. It has never been indicated in Tomita et al.’s teaching that the CF₄/CHF₃/Ar chemistry used in its chamber needs enhanced dissociation or enhanced reactivity. Tomita et al.’s

chemistry is tuned to etch a silicon oxide film. If a gas manifold, such as the ones described in Chang et al., is used to “enhance” dissociation and reactivity, the etching plasma chemistry and etching performance would undoubtedly be altered. Typically, plasma etching requires good balance between film etching and sidewall polymer deposition. Enhancing dissociation and reactivity is not necessary the goal. To achieve enhanced dissociation and reactivity, one only needs to simply increase the power. Therefore, it is incorrect to assume that enhancing dissociation and reactivity of the gases is desirable.

To establish a *prima facie* case of obviousness based on a combination of references, there must be some suggestion or motivation, either in the references or in the knowledge generally available to one having ordinary skill in the art, to combine the references in the manner proposed. As explained above, the Examiner has not established a prima facie case of obviousness against the claimed subject matter because one having ordinary skill in the art would not have combined Tomita et al. and Chang et al. in the manner proposed by the Examiner.

In addition, the Examiner states that Figures 1-4 and column 3 line 40 to column 5 line 60 of Tomita et al. have shown “the larger surface being capable of inducing an increased bias voltage at a point closer to the substrate location and a decreased bias voltage at a point closer to the second surface of the electrode,” as defined in independent claim 1. However, Applicants are not able to find such description in Figures 1-4 and column 3 line 40 to column 5 line 60 of Tomita et al. Applicants would kindly request the Examiner to point out the precise wordings of Tomita et al. that show such description. By the same reason, Applicants submit that Tomita et al. does not disclose “the larger second surface area being capable of inducing an increased bias voltage at a substrate processing surface,” as defined in independent claim 5.

Amended independent claim 9 defines that “the second surface defining a boundary of a second plasma sheath with a second plasma sheath surface, ..., the second plasma sheath surface being at least partially within the plurality of electrode openings.” Tomita et al. does not describe an electrode with a second surface defining a boundary of

a second plasma sheath. Tomita et al. does not describe a second plasma sheath surface being at least partially within the plurality of electrode openings either.

The Examiner states that inherently the plasma sheath will form within the inlet openings 55 to form the second plasma sheath surface since the openings have an opening diameter of 0.6mm. Plasma sheath thickness is affected by a number of parameters, including pressure, power, and chemistry, as stated in the Declaration filed under 37 CFR 1.132 on March 3, 2005. For the exemplary system described by Appellants, the size of the openings must be larger than 0.5 mm. However, it does not mean any showerhead with openings greater than 0.5 mm would cause the plasma sheath to shift into the electrode openings. For a showerhead in a reactor with different pressure, power, and chemistry from the exemplary system described by the Appellants, the plasma sheath thickness could be larger than 0.6 mm or 0.8 mm. For such a reactor, the plasma sheath would not necessarily shift into the electrode openings, even when the electrode openings are greater than 0.5 mm. Therefore, the case of inherency is not established.

If the plasma undesirably travels into the electrode openings of Tomita et al.'s system, it would continue to travel toward the other side of electrode (or first surface), since there is no gas feed holes, such as the ones of the claimed invention, to restrict the plasma sheath. Under such circumstance, the plasma and plasma sheath would not be bounded by the second surface of Tomita et al.'s electrode openings. This contradicts with "the second surface defining a boundary of a second plasma sheath," as defined in claim 9.

As a consequence, Applicants submit that independent claims 1, 5, and 9 are patentable over Tomita et al. in view of Chang et al. Claims 2-4, 6-8, and 10-14 are dependent claims of independent claims 1, 5, and 9. Based on the argument above, they are also patentable over Tomita et al. in view of Chang et al. Therefore, Applicants request the rejections be withdrawn.

Claims 1-14 were rejected under 35 USC §103(a) as being unpatentable over Chang et al. in view of Tomita et al. The rejection is traversed, and Applicants request reconsideration.

As described above, Chang et al. describes a gas manifold that can act as an electrode used in a plasma-enhanced chemical vapor deposition system (PECVD). Chang et al. teaches chemical vapor deposition onto a substrate. Chang et al. does not teach “inducing an increased bias voltage at a point closer to the substrate location a decreased bias voltage at a point closer to the second surface of the electrode,” as defined in independent claim 1. Chang et al. also does not teach “the larger second surface being capable of inducing an increased bias voltage at a substrate processing surface,” as defined in independent claim 5. The substrate of the PECVD system of Chang et al. is not biased; therefore, the electrode is not able to “induce an increased bias voltage.” In contrast, the exemplary system 100 described in the claimed invention has a RF power source 118b responsible for generating a bias voltage within the plasma region 112. Including the electrode of Tomita et al., as suggested by the Examiner, would not cure this problem.

To establish a *prima facie* case of obviousness, the prior art references must teach or suggest all the claim limitations (see MPEP2143). Here, in view of the incorrect characterization of Chang et al. and Tomita et al., the references as combined do not teach all the features of the claimed invention. Therefore, Applicants request the rejections for independent claims 1 and 5 be withdrawn.

In regards to amended independent claim 9, Chang et al. does not describe “the second surface defining a boundary of a second plasma sheath with a second plasma sheath surface, wherein a first plasma sheath having a first plasma sheath surface is configured to be disposed over a substrate processing surface, and the second plasma sheath surface being at least partially within the plurality of electrode opening.” The PECVD system of Chang et al. has only one plasma sheath near the substrate surface and does not have two plasma sheaths. Including the electrode of Tomita et al., as suggested by the Examiner, would not cure this problem.

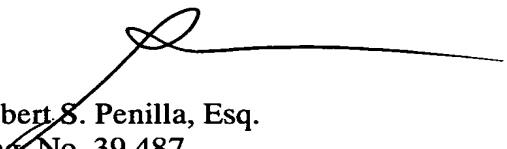
To establish a *prima facie* case of obviousness, the prior art references must teach or suggest all the claim limitations (see MPEP2143). Here, in view of the incorrect characterization of Chang et al. and Tomita et al., the references as combined do not

teach all the features of the claimed invention. Therefore, Applicants request the rejection for independent claim 9 be withdrawn.

As a consequence, Applicants submit that independent claims 1, 5, and 9 are patentable over Chang et al. in view of Tomita et al. Claims 2-4, 6-8, and 10-14 are dependent claims of independent claims 1, 5, and 9. Based on the argument above, they are also patentable over Chang et al. in view of Tomita et al. Therefore, Applicants request the rejections be withdrawn.

In view of the foregoing, Applicants respectfully request reconsideration of claims 1-14. Applicants submit that all claims are in condition for allowance. Accordingly, a notice of allowance is respectfully requested. If Examiner has any questions concerning the present Amendment, the Examiner is kindly requested to contact the undersigned at (408) 749-6900, ext. 6924. If any additional fees are due in connection with filing this amendment, the Commissioner is also authorized to charge Deposit Account No. 50-0805 (Order No. LAM1P077A2). A copy of the transmittal is enclosed for this purpose.

Respectfully submitted,
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